SCIENCE

FRIDAY, NOVEMBER 30, 1888.

THE UNITED STATES CONSUL at Manila, Philippine Islands, has written to the State Department to announce that the disease that raged during the summer at Taytay, about eight miles north-west of Manila, and which subsequently spread to the latter-named city, has subsided, and that there is now little apprehension of an epidemic. This disease was officially declared to be Asiatic cholera. It now appears, that, just before the sickness broke out at Taytay, a large consignment of rice, which had been stored in a damp place and soured, was sold among the native shops of the village by some speculative Chinamen, who had purchased it at very low rates owing to its damaged condition. As far as is known, all who ate this rice were attacked with what was supposed to be cholera. The symptoms attending the first cases were undoubtedly those of ordinary cholera-morbus, but subsequent cases showed the most prominent features of Asiatic cholera. The theory that disease is produced or aggravated by the imagination finds some support in this case. The masses, native and European, seem to live in mortal terror of cholera, which has made fearful ravages throughout these islands; and the first indication of an outbreak fills every one with fear. After the disease at Taytay was pronounced genuine cholera, the daily death-rate increased very rapidly; and, although the village was rapidly quarantined, the sickness spread to Manila, and within a week between sixty and seventy deaths occurred. As the death-rate failed to show the usual rapid increase, the hope gained ground that the physicians might be mistaken, and that what was supposed to be genuine cholera might be an unusually aggravated form of cholera-morbus. At all events, the number of deaths began to decrease a few days later, and the fear that the terrible plague of 1882 was to be repeated has now quite subsided. The total number of deaths in Manila since the disease appeared there late in August is 186.

THE AMERICAN PUBLIC HEALTH ASSOCIATION.

THE Sixteenth Annual Meeting of the American Public Health Association was held at Milwaukee, Wis., Nov. 20, 21, 22, and 23. More than one hundred and fifty members were present, representing almost every State in the Union and the provinces of Canada. The opening address was given by Dr. C. N. Hewitt of Minnesota, the president of the association. An abstract of this will be published in a future number of *Science*. Following the address, a large number of papers were read during the session of the association, to the most important of which we shall refer.

Benjamin Lee, M.D., secretary of the State Board of Health of Pennsylvania, read a paper on 'Memoranda of Visits to the Quarantine Stations of the Atlantic Coast, made during the Summer of 1888.' In this paper Dr. Lee criticises in most unfavorable terms the quarantine stations of New York, Philadelphia, Baltimore, Norfolk, and Wilmington. He sums up the defects of the entire system in the following language: "1. Want of uniformity in quarantine regulations, placing one port at a disadvantage [either commercially or sanitively] as compared with another; 2. Conflict of authority, owing to the methods of appointing officials; 3. Entire lack of appreciation on the part of local legislatures, whether state or municipal, of the importance of the expenditure of considerable amounts of money in order to render quarantines at once efficient and inoppressive; 4. Tendency on part of local civic and sanitary authorities to limit their responsibility to the protection of their own city, reckless of the consequences which may ensue to inland communities if they permit infection, which circumstances render harmless to themselves, to pass unchallenged to the latter."

Dr. Crosby Gray of Pittsburgh, Penn., read a paper on the contamination of the water-supply of a portion of that city by surface drainage. The death-rate in this portion of the city (the south side) was higher than that of the rest of the city, and typhoid-fever had been very prevalent there. An investigation proved that the water-supply drawn from the Monongahela was being seriously, steadily, and increasingly polluted by sewage, factory-refuse, and by bumboat nuisances; and that the epidemic in question had been caused by the sudden downwash, through rainwater surface drainage, of typhoid excrements from certain gulleys far above the intake, the disease having for some time been endemic in those localities in a small way.

In the course of his remarks he called attention to the following facts: "The cash value of a human life to a community has often been computed, and it is a moderate estimate of the average value of the 260 lives lost on the south side, over and above its just percentage of the current death-rate in Pittsburgh, at $1,275 each, or $331,500 together. To this should be added the burial-expenses at $50, or $13,000 in all. But, as for every death there are many ill who recover, it would be a juster estimate to capitalize the sick at ten times that of the death-rate. That would mean 2,600 people ill. The average time these persons would be compelled to remain unemployed would be, say, 30 days. This would give us 78,000 days' work lost. From this deduct 15 per cent for those below the productive period of life, which would leave 66,300 days lost. Averaging the value of a day's work at $1.25, the total loss in productivity would be $82,875. Add a quarter to this sum, on the basis of but 31 cents per day, for otherwise productive time devoted to nursing, etc., that amounts to $20,718 more; to which should be added certainly not less than $2 per case for medicine, i.e., $5,200 more. And finally there should not be forgotten the legitimate profit (say, one-third a day's wages) on its putative product, to wit, all of $27,625 more. These amounts tally $480,918 per annum, which, literally fatal waste, might be stopped once for all by the establishment of an improved water-service, drawing its supply from unpolluted sources one hundred miles off, by the timely and wise investment of this sum for two or three years."

'Yellow-Fever, Panics, and Useless Quarantines, its Limitation by Temperature,' was the title of a paper by John H. Rauch, M.D., secretary of the State Board of Health of Illinois. 'The Canadian System of Maritime Sanitation,' by F. Montizambert, M.D., quarantine officer at Grosse Isle, St. Lawrence River, and 'The Quarantine System of Louisiana, and its Improvement,' by Lucien F. Salomon, M.D., secretary Board of Health State of Louisiana, formed the subjects of papers presented by their respective authors. One of the most valuable papers presented to the association was that entitled 'Garbage-Furnaces and the Destruction of Organic Matter by Fire,' by S. S. Kennington, M.D., president of the Minneapolis Board of Health. He described the Forrestal garbage-crematory in use in Milwaukee, the Ryder in Pittsburgh, the Mann in Montreal and Chicago, and the Engle in Minneapolis, Des Moines, and Coney Island. This latter style of furnace has just been completed at Milwaukee, and was put into operation for the first time during the session of the association. Health-Officer Clark of Buffalo described the garbage-crematory in use in that city, and said that its entire running expenses were defrayed by the lubricating oils extracted, alone; so that even if no market could be found at times, or at all, for the resultant fertilizers, they might at least be used as the furnace's fuel, and thus save coal.

One entire morning session was occupied in discussing the subject of yellow-fever, which was of unusual interest by reason of the epidemics in Jacksonville, Fla., and Decatur, Ala. The following papers were read: 'The History and Administration of Quarantine in Texas, 1887 to 1888,' by R. Rutherford, health-officer of Texas; 'The Outbreak of Yellow-Fever at Jackson, Miss., in September,

1888,' by Dr. Wirt Johnson, secretary Mississippi State Board of Health; 'The Problems of Yellow-Fever Epidemics,' by Dr. Jerome Cochran, State health-officer of Alabama; and 'Some Personal Observations on Yellow-Fever and its Habitudes as Opposed to the Fallacies and Dangers of Personal Quarantine,' by Dr. A. N. Bell, Brooklyn, N.Y.

The paper by Dr. Cochran was one of the best of the entire session, and was most enthusiastically received. Dr. Cochran had just come from Decatur, and his views were the result of years of experience with yellow-fever. It was a concise and pithy statement of his opinions, and any abstract that we could now give would be entirely inadequate. We shall hereafter give a full report of it.

The closing session of the association for scientific business was occupied by the reading of the following papers: 'Tuberculosis, its Origin, Detection, and Control,' by D. E. Salmon, D.V.M., chief of the Bureau of Animal Industry, Washington, D.C.; 'Some Observations on the Origin and Sources of Disease Germ,' by Theobald Smith, M.D., of the Bacteriological Laboratory of the Bureau of Animal Industry, Washington, D.C.; and 'Meteorological Observations as respects Disease Prevalence,' by Prof. W. W. Payne, director of the Observatory, Northfield, Minn.

The interest in many of the papers was greatly increased by illustrations thrown on the screen by lantern-projection.

Chairman C. A. Lindsley of the Lomb prize committee announced the award of the first prize, five hundred dollars, to the essay on hygienic dietetics superscribed with the motto 'Five Food Products illustrated by Practical Recipes.' On opening the sealed envelope, it was found that the successful author was Mary J. Hinman, wife of John J. Abel, now resident at Strasburg, Germany, where husband and wife are attending the university. Of the sixty-nine other essays, not one was deemed worthy of being awarded the second prize.

A resolution was unanimously adopted recommending the passage by Congress of an act to establish a national health bureau in the Department of the Interior.

The following officers were elected for the ensuing year: Dr. Hosmer A. Johnson, Chicago, president; Dr. Jerome Cochran of Alabama, first vice-president; and Dr. F. Montizambert of Canada, second vice-president. The secretary, Dr. Irving A. Watson of New Hampshire, and the treasurer, Dr. J. B. Lindsley of Tennessee, were re-elected. The association will hold its next annual meeting in Brooklyn, N.Y.

SURVEYS, THEIR KINDS AND PURPOSES.

MR. MARCUS BAKER read a paper on the above subject before the National Geological Society of Washington, Nov. 2, 1888. He classified surveys as follows: —

I. Surveys for general purposes, or information surveys: 1. Geodetic; 2. Geologic; 3. Topographic (ordinary and military); 4. Agricultural; 5. Magnetic; 6. Nautical (hydrographic and physical).

II. Surveys for jurisdictional purposes, or boundary surveys: 1. For defining boundaries of nations, states, counties, towns, etc; 2. For defining property boundaries (cadastral, and partition of land for sale).

III. Surveys for construction purposes, or improvement surveys: 1. For constructing works, forts, arsenals, navy-yards, lighthouses, fishways, etc.; 2. For constructing routes of communication, roads, railroads, electric lines, pipe-lines, canals, etc.; 3. For reclamation of land, flood-plains, arid swamps, etc.; 4. For improvement of natural waterways; 5. For water-supply to centres of population; 6. For disposal of sewage from centres of population.

Surveys are of various kinds, are made for various purposes, and the results are exhibited in various ways. The kind of survey to be undertaken in any given case, the mode of conducting it and of exhibiting the results obtained, must depend primarily upon its purpose.

Numerous surveys are now in progress in the United States under the auspices of the general government, of individual States, of corporations, and of individuals. Large sums of money are annually expended upon them, and the outcome is of practical moment to many people.

It is conceived, therefore, that it will be of scientific value and of practical importance to take a general view of surveys, to enumerate and to classify them, and to set forth their purposes. It is of scientific value, because the bringing-together of a considerable number of related facts or phenomena under one general view gives rise to comparison, to study, and to deduction of general principles; and it is of practical importance, because the purpose for which any work is undertaken should be clearly formulated, that the work may be so done as to well and economically serve its purpose.

Surveys must be of various kinds, because they are made to serve various purposes. A classification of kinds is, then, a classification by purposes. The tentative schedule here suggested is one of the various possible modes of classification. Whether better or worse than other schemes of classification, is not important for the present purpose. It may serve for enumeration, and afford the basis for some study of the different kinds of surveys as determined by their purposes.

Now, the purpose of all surveys is twofold: viz., first, to acquire certain information relating to the earth; and, second, to spread this information among the people for whom it is acquired. To disseminate the information obtained among those for whom it has been obtained, the results are set forth (*a*) in the manuscript or printed page, accompanied by illustrations, diagrams, profiles, sketches, photographs, etc., and (*b*) in maps. The results of certain surveys are almost completely exhibited without the aid of maps, while in others the entire result of the survey is a map. Between these extremes we have surveys whose results require joint use of text and map in varying proportions.

In a geodetic survey the results are set forth in the printed text, in tables, and in diagram or sketch of the triangulation. In a topographic survey the result is a topographic map, and, if the survey be purely topographic, the map is the only result. These two kinds of survey, therefore, stand at the two extremes in manner of exhibiting results. In a purely topographic survey all the results are exhibited on the map; in the geodetic survey all the results are exhibited in the printed text and tables.

Surveys may be conveniently grouped into three great divisions: viz., I. Those made for general purposes, or information surveys; II. Those made for jurisdictional purposes, or boundary surveys; III. Those made for construction purposes, or improvement surveys. And these again may be usefully subdivided into several smaller groups, as set forth in the above schedule.

The well-being and prosperity of a community is intimately related to and dependent upon the resources of the region in which it lives. Recognizing this fact, civilized communities study their surroundings and resources, in order, that, by a better knowledge of and mastery over them, they may improve their condition.

The general study of the earth, its size and shape, its structure, its surface form, its surface quality, its forces, is the object and purpose of information surveys. The organization of such surveys is a matter of comparatively modern times, and an accompaniment only of the highest civilization.

When civilized man reaches that stage of development in which he recognizes that his advantage over the semi-civilized or barbarous was due to his better acquaintance with, and mastery over, nature, then was he stimulated to further study and research. Research by single individuals, in private laboratories, led to discoveries of interesting and useful facts and principles. It led, further, to the suggestion of principles of wide application, but which could only be tested by the study of many and widely separated localities. Such study being often beyond the power of the individual, and its outcome being of interest to the entire community in its organized capacity to test, the State took it up, and organized expeditions to travel in distant parts, and collect information for the benefit of the whole community. Such expeditions brought back information respecting distant parts, that served to throw light upon little-understood phenomena at home; to establish principles of higher value than the individual facts from which they had been derived; and led to the establishment of some, and rejection of other, generalizations, based upon a knowledge of only a limited area. The interesting, instructive, and useful facts brought to light by such systematic exploration and general survey showed the

practical importance and value of pushing studies of the earth still farther over all areas, and in greater detail.

From this it was seen that there would come additional isolated pieces of information useful to the world, but especially the discovery of general principles.

Thus arose exploring expeditions; and thus arose great government surveys and international surveys, — surveys organized and conducted systematically to study a great area, and to collect and diffuse information for the benefit of the people.

The general study of the earth as it has advanced has differentiated itself into several special lines of study, and has been classified under six heads, as follows: —

Geodetic Surveys.

The primary object of a geodetic survey is the determination of the size and shape of the earth, or, as is preferable to say in this connection, the geoid. Secondarily and incidentally it accomplishes much besides. It determines with highest precision the co-ordinates, latitude, longitude, and altitude, of prominent land-marks over the surface of a country. But this is not essential to its geodetic character. The earliest geodetic surveys by the French Government in France, Lapland, and Peru, measured bases, executed triangulation, and made astronomical observations, solely to determine the size and shape of the earth.

If a scheme of triangulation were planned solely with reference to the measurement of an arc of a parallel, or an arc of a meridian, then the longest lines and the fewest stations and triangles consistent with the required accuracy would be chosen. If the object were the secondary one, of locating points upon which to base other surveys, then the number, location, and accuracy of location would be made dependent upon this secondary condition.

The distinction here suggested is one not anywhere carried into effect; but by geodetic survey is usually understood a survey in which long lines are measured with high precision, and are accompanied by astronomical and gravity determinations. Measures of gravity, in so far as they contribute to a knowledge of the form of the earth, naturally belong with geodetic surveys. In so far as they relate to density and distribution of matter within the earth, they form part of a geological survey. The methods and instruments used, however, in the gravity, or gravimetric survey, closely ally it to the geodetic survey, of which it properly forms a part. Thus a geodetic survey will serve the double purpose of precisely determining the latitude, longitude, and altitude of points for practical use, and of contributing to the general stock of knowledge respecting the form, size, density, and distribution of matter of the earth. And the conduct of the survey will vary according to the prominence attached by the patrons of the survey to the one or the other of these purposes. A very rigid adherence to the "practical" aspect of the case will lead to the rejection of all plans for work not promising "practical" results, while a more liberal policy will go further, and, in addition to the immediate practical results, will aim to deduce general principles and increase the sum of human knowledge.

Geological Surveys.

While geodetic surveys are concerned with the size and shape of the earth, geological surveys deal with its structure, composition, and history. The well-being of man is most intimately dependent upon his power to forecast the future. To forecast the future requires knowledge of general principles or laws, and these general laws are derived by inference from what has been and is. To read the story of the rocks aright; to interpret their history; to establish the principles, more enduring than the rocks themselves, by which from that which has been may be correctly inferred that which shall be, — this is the great geological problem not to be solved by one geologist, or one survey, or one generation, but by the accumulated results of the studies of many men, through many generations. So conceived, it is clear that the work of the geodesist and geologist will not be finished; their work will not be perfect or complete; but each survey and each surveyor will do more or less of good work or bad as his contribution to the world's knowledge. The greatest and best results of a geological investigation or survey may finally be summed up in the general principles deduced, — principles capable of direct application to practical affairs. May we not hope some day to understand volcanic and earthquake phenomena, and, foreknowing destructive earthquakes, escape the dreaded results?

The answer seems certainly to be worth the seeking; and the seeking must needs be made by studying the earth's crust. This is the field of the geologist and the geological survey.

The clay, the marble, the gold, the coal, the granite, the iron, — these and many more in greater or less abundance, and very unevenly distributed, are useful to man. Are there not other unknown natural products useful to man? The geological surveys should seek them. From the clay comes the porcelain and the bricks; from the marble, lime; and from the coal and iron ore, the steel. Are there not hidden from our view yet many more useful products? It seems highly probable, and therefore wise economy, that the State should, for the common good, systematically collect, publish, and distribute the data and information which render such discoveries possible. That the prosperity of a community depends upon the amount and distribution of its natural resources is so obvious, that the systematic study of them is early entered upon in most civilized communities. Such systematic study is the first, the greatest, and the most important work of a geological survey: it is the foundation, and in many minds is conceived to be the only proper work, of the survey.

The purpose of a geological survey may be defined to be, to collect, to systematically arrange, to publish, and to distribute, useful information respecting the earth in general and its crust in particular.

Respecting information not yet obtained, it may not be easy to decide whether it be useful or useless. Is it of any use to know the geological structure of the region about the north pole? It may be a frozen ocean, or a bleak, rocky region, fabulously rich in gold-deposits, or, —who knows? — perhaps a knowledge of so exceptional a locality may furnish the key that will unlock unsuspected resources at our very doors. A wise policy in the conduct of a geological survey will ever seek useful information; but a wiser one will add to this search a deeper research into the unknown — far beyond the limits of immediate pecuniary returns — for the discovery of principles irrespective of immediate practical application.

Topographic Surveys.

The surface of the earth presents a great variety of forms and features. Land is flat, undulating, broken, hilly, mountainous, swampy, desert, etc. The free movement of men and traffic over this uneven surface is much affected by its form: hence, for the general information of those interested directly or indirectly in travel or transportation, a knowledge of surface form is valuable. Hence arise topographic surveys organized and carried on for the purpose of collecting, publishing, and distributing information respecting the surface forms and features of a country; i.e., respecting its topography.

'Topography' is a word used sometimes in a broad sense to indicate a description of a place or region not very large, and sometimes in a more restricted or technical sense to mean simply the surface form, the ups and downs, the hills and hollows. In the early use of the term, its meaning was the general, unrestricted one. It is now used in both senses. If English catalogues of topographical books are examined, they will be found to consist of lists of local town and county histories, local hand-books, guide-books, gazetteers, accounts of noted buildings and persons, and of events connected with local history. Maps or pictures may or may not accompany such topographical descriptions. This is the early English use of the word, — a use which still survives.

Along with this early use of the word, large-scale maps of limited areas were made, — maps which exhibited the hedgerows and highways, the orchards and ditches, the parks and houses, the streams, stone walls, gardens; in brief, all the minor details of the landscape except the surface form. The features were exhibited usually by conventional signs, but the surface form was not revealed on these maps. The horizontal plan alone appeared. The element of relief was wanting. The scales of such maps, however, were so large, that they permitted the exhibition of a large number of small features; and as such, they were called 'topographic' in distinction from 'chorographic' maps, which, on smaller scales, embraced in

one map a much wider field, from which all minor features had been of necessity excluded.

The value and importance of these topographical maps for military purposes were brought into great prominence during the Napoleonic wars. Napoleon, recognizing their importance and value, gave a powerful stimulus to military surveying. He also clearly perceived the value and importance of representing the hitherto unrepresented element of surface form, and to him is said to be due the introduction on topographic maps of a representation of the relief. Then arose systems of different kinds for showing form as well as feature, and thereafter the exhibition of the relief came to be regarded as essential to a topographic map. Thus the word 'topography' underwent a change, an extension of meaning, — an extension to be followed later by a restriction of meaning. When usage had established that by 'topography' both the form and the features of the surface were implied, then the need of distinct terms expressing these two elements arose. Very soon we find 'topography' being unconsciously used to imply surface form alone, and this unconscious use has now become conscious and established. A new word or phrase is therefore needed to express the features, but we have no such term. Thus at first 'topography' relates to surface features, and chiefly artificial ones, villages, roads, cities, orchards, walls, gardens, buildings of various sorts, etc., and all water bodies; later the term is expanded to mean all these, and in addition the surface form; and finally, before losing this extended signification, it is restricted, and used to signify surface form only. Primarily it related to features only: it is now used to relate to surface form. At the same time the earlier, but not earliest, use survives, and is used to imply both forms and features: hence have arisen apparent disagreement and discussion from confusion of meaning of the word.

The features exhibited on maps called topographic may be conveniently grouped into three heads: (*a*) the water features, — ponds, streams, lakes, etc.; (*b*) the surface form, — hills, valleys, plains, etc.; (*c*) the features constructed by man, — cities, villages, roads, etc.; and, if need be, general terms might be coined to express these three classes of phenomena.

The description of water features would naturally be the 'hydrography;' the description of the form, 'cidography;' and the description of the constructed features, the 'tectography.'

This seeming long digression into the meaning of the term 'topography' is only seeming. As a piece of word-history, it is not pertinent; but, as a prerequisite to a clearly defined comprehension of the subject rather than the word, it is of first importance. The proper conduct of a topographic survey requires a clear understanding of what it is, what it is not, and why it is made. What, then, is the object and purpose of topographical surveys?

The object and purpose of topographical surveys is, as I conceive it, the production of topographical maps, — a definition which, without a definition of 'topographical map,' appears meaningless. But even before defining that particular species of map called 'topographic,' it appears that the aim of the survey is solely to produce a map. Its purpose is not the erection or refined location of monuments, nor the tracing of boundary-lines, public or private, nor the establishment of bench-marks. The doing or not doing of these things does not destroy the essential character of the survey, which is the production of a topographical map, — a map which shall exhibit, with an accuracy and detail sufficient for all general purposes, the relation of the features of a country to one another, and to the form of the surface upon which they are. The erection, description, and location of boundary-marks is the special work of the boundary survey; the erection, description, and precise determination of bench-marks — as permanent reference-marks — is the work of the geodetic survey; while the less precise determination of many unmarked stations for temporary use in map-making is the work of the topographic survey.

The topographic survey, like all others in our first category, — the geodetic, geologic, etc., — is not special, but general. It is not made for the purpose of constructing railroads, though a very valuable aid in projecting railroads. It is not made for the specific purpose of reclaiming swamp-land, or arid land, or flood-plain land; but it furnishes general information essential to a preliminary study and plan for improvement. It is not made specifically for war purposes, though useful for such purposes, and serving as a basis for special surveys for military purposes. It is not made for any one specific purpose, any more than a jack-knife is; but, like the jack-knife, it serves many purposes, even though it serve some of them less well than a special tool constructed for the special purpose.

The outcome of a topographic survey, being a topographic map, should be judged by the map; and the map, being for general purposes, should be judged by the manner in which it serves the general rather than the special purpose. And, further, of two maps, or works of any kind, made for the same purpose, and serving that purpose equally well, that one is best which is the cheapest, — a well-recognized principle, especially among engineers.

In the conduct of a topographical survey, one most important question must be decided in advance; viz., the scale to be adopted. Almost all questions of detail hinge upon this. Large-scale maps permit the exhibition of many and small details, and of the relation of objects to one another, with greater precision than small-scale maps, just as a high-power microscope reveals details not to be seen with lower power. For certain purposes microscopes of only very low power serve best; for others, those of moderate power; and for still others and special purposes very high powers serve best. So, also, for many purposes maps of small scale are desirable; for others, maps of moderate scale; while for other and special purposes maps of very large scale serve best. What the best scale is for general purposes has been the subject of very animated and even heated discussion in European countries, particularly in England, where, in connection with the Ordnance Survey, the "battle of the scales" was fought with great vigor some thirty-five years ago. And, as is apt to be the case in such controversies, there were good reasons on both sides, — good reasons for making the scales large, and other good reasons for making them small. The best scale to adopt, therefore, all things considered, was a matter of judgment, and hence the diverse views.

There seems to be no better way of getting at general opinion upon the subject of scales than to see what, as a result of study and experience, various map-making nations have adopted.

The following table, therefore, is presented, showing the scales upon which fourteen foreign states are constructing, or have constructed, general topographic maps of their areas: —

PUBLICATION SCALES OF STANDARD TOPOGRAPHIC MAPS OF FOREIGN STATES.

India	1 : 253,440
Russia	1 : 126,000
Germany	1 : 100,000
Norway	1 : 100,000
Portugal	1 : 100,000
France	1 : 80,000
Austro-Hungary	1 : 75,000
Great Britain	1 : 63,360
Sweden	1 : 50,000 and 1 : 100,000
Italy	1 : 50,000
Spain	1 : 50,000
Denmark	1 : 40,000 and 1 : 80,000
Switzerland	1 : 25,000 and 1 : 50,000
Belgium	1 : 20,000 and 1 : 40,000

These scales all cluster around one mile to an inch. In countries of small extent and of dense population the scales are larger. In countries of larger extent and sparser population the scales are smaller. The lesson taught by this table is conceived to be of great value in determining the scale or scales that should be adopted for a general topographical map of the United States.

A statement recently published, that "maps upon a scale of less than two inches to one mile are of but little use for definite purposes," is therefore an individual opinion, which contrasts with the general opinion in such matters, as inferred from the scale in use by nations conducting topographic surveys.

Topographic surveys may be conveniently classified under two heads having reference to their purpose. If made for general use and information, they constitute the ordinary or usual topographic survey; while, if made for war purposes, they are military topographic surveys. Most of the great militant nations make special surveys and maps, which are unpublished, and are kept secret in the archives of the War Department. The changes in the mode of conducting wars incident to improvement in fire-arms and explosives necessitate corresponding changes in the military maps.

Agricultural Surveys.

Special studies of the character and distribution of soils, and of related phenomena having an immediate bearing upon the cultivation of useful crops, are known as agricultural surveys. The classification of land into groups, as desert, grazing, mining, forest, swamp, etc.; the classification and properties of various soils, as marl, loam, sand, clay, hammock, adobe, etc.; the study of climate as related to crops; the study of animal life, and especially the distribution of animal life, beneficial or injurious to agriculture, — all these, with related phenomena, involve special examination and study in the field, and together form the special work of the agricultural survey. The special results of the distinctively surveying part are classification and distribution, — results exhibited on maps — or topographic maps — prepared for general purposes. The work carried on, and the results obtained, at agricultural experiment stations, are an important, indeed essential, adjunct, but do not of themselves constitute an agricultural survey.

Magnetic Surveys.

The earth is a magnetic body. When magnetized bodies, such as compass-needles (free to turn horizontally) or dipping-needles (free to turn vertically), are so suspended as to yield to the influence of the magnetic earth, they move in response to its magnetic force, and take up certain positions or directions. These directions vary with time and with place; also the intensity of the magnetic force exerted by the earth is found to be different in different places, and not to be constant at the same place.

Magnetic surveys are therefore organized to obtain observations of these magnetic phenomena in various places and at divers times, to study them, and to publish the results for general information, the purpose being twofold: viz., first, to ascertain for the general and practical use of persons using the compass, etc., magnetic declination or "variation of the compass" at any point of the earth's surface at any time; and, second, the observation and study of all terrestrial magnetic phenomena with a view to the perfection of a theory whereby all such phenomena may be predicted. As already suggested, the magnetic declination varies with time and with place; the dip also varies with time and with place, and the force varies with time and with place. A knowledge of the declination is of immediate practical use to many people; a knowledge of the dip and intensity, however, is of less immediate practical utility. But for a bettering of our knowledge of the whole subject of terrestrial magnetism, for the establishment of principles respecting it, all its manifestations should be investigated by the magnetic survey.

If a magnetic survey of a State were undertaken for the purpose of producing an isogonic map, or map showing by curves or shading the declination at all points in the State, for the practical use of compass-users, different plans might be used for the purpose.

A few stations widely separated and scattered over the State might be selected, and a precise determination made at each by using sufficient time, care, and delicacy of instrument. This would give refined results and few stations.

On the other hand, by using much less time at each station, and less delicate instruments, more stations could be occupied, and a greater number of less precise determinations obtained in the same time. This latter would have the advantage of showing distribution better than the former.

For showing distribution of rainfall, it would seem that observations at five hundred stations, giving results accurate within one or two inches, would be for many, if not for most, purposes better than the results from fifty stations accurate within one or two tenths of an inch, or ten times as accurate as the former. Similarly, if for the purpose of constructing an isogonic map we have our choice between determinations of declination at one hundred stations accurate within one or two minutes, and determinations at one thousand stations accurate to within ten to twenty minutes, it may not be easy to decide which to choose. Surveys have been tried in the United States by both methods, neither of which completely satisfied the parties conducting them. The latter method has not been sufficiently tested experimentally to prove its quality. But, for the purpose of producing an isogonic map for a given epoch, the writer considers it better to go rapidly over the area to be mapped, securing a very large number of observations at many stations and of only a moderate degree of accuracy, than to have highly refined and precise measures made at only a few stations.

Nautical Surveys.

As the object and purpose of a topographical survey is the production of a map, so the object and purpose of a nautical survey is the production of a chart. Such has been the only purpose until recent years, when the ocean, its movements, its inhabitants, its depths, have become subjects of special study. This special field, under whatsoever name included, — whether 'ocean physics,' 'thalassography,' or 'physical hydrography,'— is only indirectly and remotely connected with nautical surveying as usually understood: hence we may regard the term 'nautical surveying' as embracing ordinary hydrographic and physical hydrographic surveys; the object of the first being chart-making, and of the second an investigation of the oceans and great water bodies for purposes connected more or less indirectly with navigation. The chart produced by the nautical surveyor is usually supplemented by some form of directory, or hand-book, or coast-pilot, giving certain data useful to the mariner in addition to that afforded by the chart.

Similarly, the map produced by the topographic surveyor may be usefully supplemented by some form of guide-book, gazetteer, or geographical dictionary, affording certain useful data supplemental to that contained on the maps.

Tidal observation and current observation form proper parts of ordinary nautical surveys. The purpose of such observations is the immediate and direct one of aiding navigation: hence the selection of stations, and the character and extent of the observations, will be made to accomplish this purpose. If, however, the tidal observations are made for obtaining data whereby the theory of the tides may be perfected, if the current observations are made to discover the general laws of oceanic circulation and their results, then these considerations will lead to a choice of stations and methods, and amount of observation, which gives promise of best serving that purpose.

We have now briefly reviewed and commented on six species of information surveys, — geodetic, geologic, topographic, agricultural, magnetic, and nautical. These surveys are all national works, covering wide areas and long periods for their execution. Moreover, most of them cannot be done once for all, but must be repeated from time to time. The best and completest and most perfect work of the eighteenth century does not satisfy the demands of the nineteenth; and the surveys of the nineteenth will serve their purpose, even if the twentieth century finds it necessary for its purposes to make new and better surveys. The object of a survey is not the attainment of the highest possible precision. Great accuracy is needful for the accomplishment of certain purposes. Such accuracy, however, is not itself the purpose: it is only the means to the end. What the purpose of information surveys are, we have tried to set forth. If correctly set forth, these purposes will furnish the criteria for judging of the precision which should be striven for in any work; and it will thus appear, that, if an accuracy less than the greatest will serve a specified purpose, the greatest accuracy and the cost of securing it are unnecessary. The work done should be sufficiently good for its purpose.

Boundary Surveys.

The second great division in our enumeration consists of boundary surveys, and these may be conveniently grouped under two heads: first, those lines which separate communities or jurisdictions, such as towns, counties, states, and nations; and, second, property boundaries, or boundaries of private ownership. Perhaps the terms 'public boundaries' and 'private boundaries' might be used to indicate these two groups.

Boundary surveys differ from information surveys in this: they deal with lines, information surveys deal with areas. The problems presented by the boundary survey are generally more definite and explicit than those of surface surveys, and there is correspondingly less opportunity for display of judgment and skill in their conduct.

The purpose of a boundary survey is to mark out a line on the earth's surface. As the marks placed by such survey are subject to loss, removal, or obliteration through neglect or malice, it is es-

sential that a record be made giving all needful details for restoring lost marks. The making of the record, however, though an important matter for practical reasons, is a secondary matter to the surface marks which define the boundary. It is the loss of the ground marks, and not the loss of the record, that makes boundary re-surveying necessary. Few if any boundaries are ever so perfectly or completely marked out that subsequent surveys are not necessary. Much of the work of the boundary surveyor, therefore, consists in the retracing of lines, or, what is the same thing, the recovery of old marks. The law, decree, or what not, which prescribes the boundary is the guide for the first survey. Subsequent surveys have the same law and the old notes by which to recover the line as first marked. And as successive surveys, more or less well or ill done, in the course of years accumulate records of more or less obscurity, the work of the surveyor comes to be more and more a study of law and the untangling and interpretation of records.

The language defining a boundary is often such as to be incapable of interpretation, or it prescribes impossible conditions. The north-eastern boundary of Massachusetts has been, and the south-eastern boundary of Alaska may be, in dispute for the same reason. Each requires a line parallel to the winding of a coast or stream.

The partition of the public lands for sale is a particular case of boundary-surveying. These surveys, executed in the wilderness in advance of settlement, were for the purpose of staking out the ground for farmers.

From the nature of the case, much of this surveying was rough and poor. But though roughly and badly done, though the quarter-sections often differ materially from the one hundred and sixty acres, though the rough records show illiteracy or are obscure, nevertheless, whenever the staking-out of the lines on the ground was well done, the survey was well done, for it achieved its chief purpose. But in many places the staking-out was badly done or not done at all; a burnt match passing for a charred stake, and a pebble for a stone monument. In such places the local surveyor will find employment in recovering old land-lines.

The importance of having boundaries well and clearly defined need not be dwelt upon. The perpetual litigation over property boundaries, the litigation in which decisions involve question of boundary, the irritation and occasional wars between nations over boundary questions, sufficiently emphasize the importance of such surveys. The practical need is not merely that a boundary-line should be once surveyed and marked, but that it should be continually marked. The lines should be therefore re-examined from time to time, and lost marks renewed. It appears obvious that such work should be continuously in charge of an officer or little corps of boundary surveyors, who, in an office for the purpose, accumulate the records of all boundaries under their jurisdiction, and who are charged with the maintenance of boundaries. The general government might appropriately undertake the task of marking and maintaining the boundaries of the States, while the individual States might assume control of all boundary-lines within the State. The successful and economical mode of performing such work would seem to consist in abandoning the job or contract system, and substituting a permanent organization, — an organization in which special aptitude, special knowledge, experience, and fidelity would be required. Entrance to such an organization should be solely on account of such qualities, and permanence of tenure in such work is essential to its success. Under such a system, both the States and the United States can economically undertake the work of establishing and maintaining their ancient land-marks.

Improvement Surveys.

The last great division in our classification is that of surveys made as a preliminary or basis for the construction of works or improvement surveys. These surveys may be generally characterized as special. They are made for some one specified purpose; and that purpose, being construction of some sort, almost if not quite universally demands large-scale maps. All improvement surveys may be regarded as 'special' in distinction from 'information' surveys, which are made for general purposes. The general survey is therefore the natural and economic forerunner of, but not a substitute for, the construction survey.

If a canal or railroad is to be constructed to connect the Gulf of Mexico with the Pacific Ocean, a general topographic map of the region exhibiting the drainage and surface form would at once narrow the question of location down to a very few alternative propositions, or might even completely determine the location. But such general map, even if on a very large scale, and very detailed and very accurate, does not obviate the need of construction surveys. The construction of railroads from the south-eastern Atlantic seaboard into and across the Appalachian Mountain system into the Mississippi basin, is greatly facilitated by the aid of general topographic maps,— maps which, even on moderate or small scales, obviate almost or quite completely the need of trial or random lines or preliminary surveys. To attempt to make a general topographic map with such minuteness of detail, with such precision and on such a scale as to permit its economic use for construction purposes, is to undertake a work that will in general fail of its purpose: construction surveys will still be needed. The information survey affords the material for intelligent and economical planning of improvements; the construction survey furnishes the working drawings and details. The information survey for general purposes takes cognizance of the larger and more permanent features; the construction must take account of much smaller and more ephemeral features. And because construction surveys require information respecting ephemeral features, it is not economical to have such surveys completed long in advance of construction.

As the scale of a general topographic map is increased, the amount of detail shown is increased. And it is possible so to enlarge the scale, and so to multiply the amount of detail shown, as to lay plans for improvements with great definiteness, and even in some cases to begin simple construction works without further information than that afforded by such maps. But, by reason of rapid change of small features, construction must in general follow very quickly after the execution of the survey; and the usefulness of the maps for most purposes declines rapidly with the lapse of time. Large-scale and detail maps of the suburbs of growing cities and towns become quickly antiquated: they serve temporary needs, and are replaced by new ones similarly serving temporary purposes. This being the case, good economy requires that they be made quickly and cheaply.

As topographic maps on very large scales may be made in certain cases to a limited extent for construction purposes, the purposes of topographic surveys, and of surveys for constructive purposes, are sometimes confused. Some engineers demand that a topographic map shall not only serve the general purpose of giving topographic (that is, eidographic) information, but shall also give all details needful for completely planning the construction of works. Such demand implies a confusion of the purposes of information surveys as above set forth,— a confusion through which nearly all map-making nations have passed. Topographic map-making on any extended scale is comparatively new in this country, and the general ideas prevailing respecting them are those which were held in Europe forty or more years ago. At that time it was held that a single map could be made to serve all purposes; and this, of course, required large scales. Then the work progressed slowly, and became very expensive. Moreover, such maps very soon fell in arrears, and were presently hopelessly in arrears. Out of this experience was slowly evolved the principle that maps, and the surveys needful to make them, should fall in three great categories: viz., (*a*) general or chorographic maps, i.e., on a small scale (from $\frac{1}{200000}$ downward), covering the grand features of an area of considerable extent; (*b*) special or topographic maps, i.e., maps on moderate scales (from $\frac{1}{200000}$ to $\frac{1}{20000}$), covering a correspondingly smaller area, and exhibiting all the natural and prominent artificial features of which the scale admits; and (*c*) very large scale plans or diagrams (from $\frac{1}{20000}$ upward), such as parish plans, town plans, cadastral maps, or land-office plats, etc. Between these categories, sharply defined lines do not exist. But the experience of the European nations has in the course of time brought clearly to view the practical importance of differentiating these three classes. And so it has happened that nations formerly making a general topographic map on very large scales are now making them, or have completed them, on greatly reduced scales.

We have subdivided construction surveys into six groups, which

do not need special characterization. The special purpose of each is indicated by its name. The special mode of conducting each for accomplishing its purpose will depend upon many details beyond the scope of this discussion.

HEALTH MATTERS.

Distribution of Consumption in New Hampshire.

THE extent and distribution of consumption in New Hampshire are admirably set forth in a paper by Dr. Irving A. Watson, the secretary of the board of health of that State. The prevalence and fatality of this disease are illustrated by a number of diagrams. From the figures quoted by the author of the paper, it appears that during the three years 1885–87 there were in the State 2,432 deaths from consumption. It is interesting to compare with this the deaths from other forms of disease. From heart-disease there were 1,536 deaths; pneumonia, 1,526; apoplexy and paralysis, 1,421; old age, 1,347; cholera infantum, 918; cancer, 637; typhoid-fever, 464; diphtheria, 411.

From a careful study of consumption in New Hampshire for the past six years, but more especially from the registration returns of the years 1885, 1886, and 1887, the following conclusions are arrived at: —

1. The disease prevails in all parts of the State, but is apparently influenced by topographical conditions, being greater at a low elevation with a maximum soil-moisture, than in the higher elevations with a less moist soil. The prevalence of other diseases also affects the death-rate from consumption.

2. That the season has only a small influence upon the mortality from this disease. The popular idea that the fatality is greatest in the winter is shown to be erroneous, the greatest number of deaths occurring in May.

3. That the mortality is considerably greater in the female sex.

4. That no age is exempt from this disease, but that the least liability of its development exists between the ages of two and fifteen, and the greatest between twenty and thirty. Advanced age does not assure any immunity from the disease, as is generally supposed, but the smaller number of decedents is due to the fewer living persons of that advanced period of life.

5. The death-rate from pulmonary consumption is relatively much the larger among the foreign-born.

6. The average death-rate from consumption for the years 1885, 1886, and 1887, is 12.86 per cent of the total mortality of the State. In Massachusetts, for the ten years ending 1886, deaths from consumption averaged 16.10 per cent of the total mortality; and in Rhode Island, for a period of twenty-five years, ending 1884, 16.30 per cent. This shows a greater freedom from the disease in New Hampshire than in the two States mentioned.

ALCOHOLISM. — Dr. Lewis D. Mason discusses, in the *Quarterly Journal of Inebriety*, the etiology of dipsomania and heredity of alcoholic inebriety. He has collated a large amount of testimony bearing on this subject; and from this, and from his own experience, which has been very large, he draws the following conclusions: first, alcoholism in parents produces a degenerate nervous system in their children, and subjects them to all forms of neuroses, — epilepsy, chorea, paralysis, mental degeneracy, from slight enfeeblement to complete idiocy and insanity; second, alcoholism in parents produces a form of inebriety in their children known as dipsomania, which in the large majority of cases is inherited in the same manner that other diseases are inherited, and we can with propriety and correctness use the term 'alcoholic or inebriate diathesis' in the same sense that we use the term 'tubercular diathesis,' or other terms indicating special tendencies to other inheritable diseases.

TOBACCO-SMOKE AS A DISINFECTANT. — It has long been a cherished theory, at least of smokers, that the fumes of tobacco were to a certain degree disinfecting in their action. To put this theory to a test, Dr. Vincenzo Tessarini, of the University of Pisa, has recently conducted an investigation into the action of tobacco-smoke upon micro-organisms. He devised an apparatus consisting of two funnels placed with their mouths opposed, and sealed with paraffine. To each small end of the funnels tubes were attached, suitably arranged so that a cigar could be placed in one end, while the bacteriological smoker inspired at the other. The smoke was thus drawn into the large space made by the funnels, in which was a plate with various cultures of micro-organisms; control cultures were also used. The microbes were subjected to the smoke for from thirty to thirty-five minutes, during which time from 3½ to 4½ grams of tobacco were used. The micro-organisms tested were the *spirillum choleræ Asiaticæ*, *spirillum* Finkler and Prior, *bacillus anthracis*, *bacillus typhi abdominalis*, *bacillus pneumoniæ*, *staphylococcus pyogeneus aureus*, and *bacillus prodigiosus*. The kinds of tobacco used were the large Virginia cigars, the large Cavour cigars, the small Cavour cigars, the best cigarette tobacco. The results show that tobacco-smoke has the effect of preventing the development of some micro-organisms entirely, and of retarding that of others. The Virginia cigars seemed to have the most powerful effect, while cigarette-smoke had only a retarding influence, and did not entirely check the growth of any form. By first drawing the tobacco-smoke through water, it was found to have lost its germicidal properties.

FATIGUE FROM USE OF THE TELEPHONE. — At the meeting of the American Otological Society in Washington, Dr. Clarence J. Blake of Boston read a paper on the influence of the use of the telephone on hearing-power. He thinks that this influence must be injurious, because the extremely low intensity, as demonstrated by experiment, of the sounds to be caught from the telephone, compelled a strain of the ear which soon fatigued it, and made it especially liable to injury by the accidental sounds of comparatively high intensity, which were constantly liable to be heard. Dr. C. H. Burnett said he had seen several patients who believed that the continued use of the telephone had impaired their hearing. Dr. O. D. Pomeroy gave the case of a patient who said the use of the telephone fatigued her very much, and she thought had made her decidedly worse.

DISINFECTING LETTERS. — The *American Analyst* describes as follows the method adopted by the United States Government for the disinfection of letters coming from districts in which yellow-fever prevails. Letters from the stricken section are fumigated in a novel way, so that there is little or no chance for the disease being brought northward. The letters are all stopped when they reach the quarantine lines. Each letter is put under a machine with a long arm attached, and this is provided with little teeth punctured at the ends. A powder that is used for fumigating purposes is forced through the arm and down through the teeth. The arm comes down on each letter, and, while the little teeth are perforating the letter, the powder is blown in between the sheets, disinfecting the letter thoroughly. We had understood that after the perforations were made the letters were exposed to the fumes of burning sulphur. If the *Analyst* is correct in its statement, it would be a satisfaction to know what the powder is which thus disinfects the letters so thoroughly. So far as we know, there is no powder which has this power when employed in the manner described, and, until we receive further information, we shall look upon the whole process with distrust.

CIGARETTE-SMOKING. — The poisonous effects of cigarette-smoking have been experimentally determined by William L. Dudley, M.D., professor of chemistry in the Vanderbilt University at Nashville. He describes his methods in the *Medical News* of Sept. 15, 1888. The fact that cigarette-smoking produces physiological effects differing to some extent from those of the cigar led him to make his experiments. The frequently ascribed causes of the difference — that of the adulteration of cigarette tobacco with opium and other drugs, and also the presence of arsenic in the paper — are for many reasons unsatisfactory and insufficient. It is true, no doubt, that the tobacco in many of the less expensive brands is adulterated with cheap drugs and artificial flavors, and that in the more expensive grades opium may be used; but it is equally true that many cigarettes are made of tobacco which is free from sophistication. The presence of arsenic in the paper is entirely out of the question. There is a difference in the methods of

smoking a cigarette and a cigar or pipe. In the two last mentioned the smoke is simply drawn into the mouth and expelled directly therefrom or through the nose, while the experienced cigarette-smoker will inhale the smoke; that is, draw it to a greater or less extent into the air-passages, and in some cases to the greatest depth of the lungs, and thus the absorption of the carbonic oxide and other gases will take place very rapidly, causing more or less deoxidation of the blood, and thereby impairing its power to build up the wasting tissues of the body. Acting upon this theory, Dr. Dudley proceeded to experiment on animals, and obtained for the purpose some mice. The animal to be experimented with was placed in a glass bell-jar, into which the smoke of a cigarette mixed with air could be drawn as rapidly as desired by means of a laboratory aspirator. In the first experiment the smoke was purified as much as possible; and the atmosphere breathed by the animal was practically oxygen, nitrogen, and carbonic oxide. The cigarette was loosely inserted in the end of a tube having two bulbs. These bulbs contained a solution of potassium hydrate to absorb the carbon dioxide and any acids or condensable bodies. A tube was provided containing solid potassium hydrate broken into small lumps, which retained any carbon dioxide that may have escaped the bulbs. The animal was placed in the bell-jar and the apparatus connected together. An aspirator was turned on so as to draw a slow current of air through the apparatus. The cigarette was then lighted, and in twenty-two minutes the animal was dead. On examination of the blood of the animal by the spectroscope, it was found that all of the oxyhæmoglobin had been converted into carbonic-oxide-hæmoglobin, which showed that carbonic oxide was the cause of the death. This experiment was repeated, and the result was the same: the animal died in twenty-five minutes, and the spectroscope revealed the same condition of the blood. A third experiment was made without the bulbs. The tube carrying the cigarette was connected directly. In this case the animal died in six minutes, and the examination again showed that the carbonic oxide was the immediate cause of death, proving that it was the most noxious constituent of the tobacco-smoke. The time required to produce death in the last experiment was about one-fourth that required in the first and second. This was probably due to the fact that in the latter the smoking was done more rapidly than in the preceding, owing to the lessened resistance in the apparatus, and the difficulty encountered in reducing the force of the aspirator. In each case, however, the amount smoked up to the time of death was about the same, — one and one-fourth cigarettes. From these experiments the following conclusions are drawn: 1. That carbonic oxide is the most poisonous constituent of tobacco-smoke; 2. That more injury results from cigarette than cigar or pipe smoking, because, as a rule, the smoke of the former is inhaled; 3. That cigarette-smoking without inhaling is no more injurious than pipe or cigar smoking; 4. That the smoke of a cigar or pipe, if inhaled, is as injurious as cigarette-smoke inhaled; 5. That the smoke from a Turkish pipe, if inhaled, is as injurious as that of a cigarette inhaled.

THE SIGHTSEER'S HEADACHE. — Of the lighter penalties which pleasure entails, none probably is more widely known and felt, or more persistently endured, than the sightseer's headache. It is nature's tax levied on the comfort of that great body of busy idlers to which we all at some time or other belong. In reference to this, the *New York Medical Record* states that it is endemic among the frequenters of museums, picture-galleries, and exhibitions, varying somewhat perhaps in different cases in its precise causation, but associated always in a manner significant of its origin with the habits of the observant loiterer. The circumstances in which it arises afford the most reliable clew to its true character. Among these, temperature, atmosphere, and strain both of body and mind, though commonly combined, play their several parts in varying degrees of activity. The influence of a warm and close atmosphere as a cause of headache is too well known to require more than a passing notice. The torpid congestion of tissue which it tends to induce, and from which the brain is not exempted, is familiar to most of us as a morbid process too often illustrated in our painful experience. It contributes its proportion, doubtless, toward that total of *malaise* which affects the visitor to a crowded picture-gallery or assembly-room, and culminates in the localized ache which renders the slightest mental effort a weariness. The very general prevalence of this variety of headache, however, and its independence in many instances of any vitiation of atmosphere, teach us to look for its explanation in other causes. The effort of mind implied in long-continued observation, even though this does not involve the strain of study, has probably an appreciable though a secondary influence. Fatigue certainly has an important share in its production; but it is with most persons rather fatigue of muscle than of brain. The maintenance of the upright posture during several hours of languid locomotion, the varied and frequent movements of the head commonly in an upward direction, and the similar and equal restlessness of eyes whose focus of vision shifts at every turn as a new object presents itself, form a combined series of forces more powerful in this respect than the sunlight and frequent changes of mental interest and attention by which they are accompanied. The muscular strain implied in these movements is necessarily very considerable. It affects more or less every member of the body; but the distant localization of the resulting ache has probably much to do with the unusual activity of the cervical extensor and rotator muscles, and of the muscles which move the eyeball. Whatever the minor influences at work, therefore, there can be little doubt that mere fatigue is primarily accountable for this most general form of headache, and that rest and nourishment are most reliable antidotes. The utility of stimulants for this purpose is necessarily temporary and deceptive. One improvement on existing arrangements ought to be of real assistance to the suffering sightseer if more generally introduced by responsible authorities. The comparative scarcity of seats in many places of amusement has often been noticed. It would be much to the public advantage if this want were supplied. For the attendants at exhibition-stalls a chair for occasional use is an absolute necessity.

DIPHTHERIA SPREAD BY CATS. — Domestic animals have often not only been suspected but found guilty of spreading infection. In his report on the recent sustained prevalence of diphtheria in Enfield, England, Dr. Bruce Low of the medical department of the local government board incidentally states that during the continuance of the epidemic cats were observed to suffer in considerable numbers from illness; and in December, 1887, and in January, 1888, there was a large mortality among those animals, — so much so, that the attention of the dust-contractor was directed to it. He stated that never in his previous experience had he seen so many dead cats in the dust-heaps. Some households, seeing their cats ill, destroyed them. Though there were no known cases of diphtheria occurring in the practice of the veterinary surgeons at Enfield, yet they saw many cases of 'influenza' at this time among animals. The following is an illustration of the possible connection between diphtheria in children and in cats: A little boy was taken ill with what turned out ultimately to be fatal diphtheria. On the first day of his illness, the cat, which was in the room at the time, licked the vomit on the floor. In a few days (the child meanwhile having died) the animal was noticed to be ill, and, her sufferings being so severe, and so similar to those of the dead boy, the owner destroyed her. During the early part of its illness, this cat had been let out nights in the back yard, as usual. A few days later the cat of a neighbor, who lived a few doors farther off, was noticed to be ill. It had also been out in the back yards at night. The second animal, which, however, recovered, was the pet and playfellow of four little girls, who, grieved at the illness of their favorite, nursed it with great care. All four girls developed diphtheria, the mother being convinced that they got it from the cat; and, indeed, no other known source of contact with infection could be discovered. It is easy to imagine cats catching infectious diseases like diphtheria, when we remember how often milk and other unused food from the sick-room is given to the cat, or by some people thrown out in the back yard for the benefit of their neighbors' cats if they have none of their own. It is a frequent occurrence to see children carrying cats in their arms, and even kissing them. It is obvious, that, if the cats were ill with diphtheria, the children, under such circumstances, would almost inevitably contract the disease.

ELECTRICAL SCIENCE.

Execution by Electricity.

IN view of the new law of the State of New York, doing away with hanging, and the substitution of electricity as the means of execution, a committee was appointed by the Medico-Legal Society to consider the best method of carrying the law into effect. The committee consisted of Dr. Frederick Peterson, Dr. J. Mount Bleyet, R. Ogden Doremus, and Dr. Frank H. Ingram. The committee submitted its report on the 14th inst.

The committee first mentions the experiments made by the commission appointed by the governor to examine into the various methods of causing death. These experiments consisted in placing dogs in a zinc-lined box, partly filled with water, one pole of the dynamo being the coating of the box, the other being a wire wound around the dog's nose or inserted in his mouth. Death was certain and instantaneous, but no data were obtained as to the potentials or currents used. During the summer, experiments were carried out at the Edison laboratory on a number of dogs; and it was shown that an alternating current of 160 volts was sufficient to kill a dog, and that with a continuous current a much higher voltage was necessary. The report proceeds as follows: —

"The average resistance of the human body is about 2,500 ohms. The most of this resistance is in the skin. It is evident, therefore, that the larger the surface of the electrode applied to the body, the greater will be the resistance. It is also a fact that the density of the current depends upon the superficial area of the electrode. A pole of small diameter will hence meet with less resistance, the passing current will be more intense, and the resulting current strength will be greater, than when an electrode of large sectional area is employed."

These statements are not correct; but, before referring to them further, we will summarize the rest of the report. The committee goes on to state that "there can be no doubt that one electrode should be in contact with the head," and recommends that the other be placed in the neighborhood of the spine. To practically carry this out, it proposes that a helmet, containing one electrode, be fitted on the head of the criminal, and he be bound to a table or in a chair, the other electrode fitted so it will impinge on the spine between the shoulders. "The electrodes should be of metal, not over an inch in diameter, somewhat ovoidal in shape, and covered with a thick layer of sponge or chamois-skin. The poles, and the skin and hair at the points of contact, should be thoroughly wetted with warm water. The hair should be cut short." An electromotive force of not less than 3,000 volts should be used, preferably alternating.

In criticism of this report, it should be remarked, in the first place, that the statement, that, because the greatest resistance of the human body is in the skin, "the larger the surface of the electrode applied to the body, the greater the resistance," is directly opposed to fact. The larger the electrode, the *smaller* will be the resistance, and this fact would point to a comparatively large electrode being used.

Again: it is not evident that one of the poles should be applied to the head. It is probable that very little of the current would penetrate the skull and pass through the brain, and that the greater part would pass through the tissues between the skin and the bone. It is probable that a current passing from one arm to another, traversing the vicinity of the heart, would be much more certain in its action than by the plan proposed, with the additional advantage that it is very easy to make contact with the arms. In almost, if not all, the fatal accidents that have occurred, the current has passed in this manner; and by insuring good contacts, and employing 3,000 volts, the results would be reasonably certain. As for the current through the head, we have no data as to the effects produced.

Finally, if the criminal is to be executed according to the plan proposed, the electrodes should be moistened with acidulated or salt water, not simply warm water. The only good feature of the report is in the potential recommended. An alternating current of 3,000 volts would in all probability kill the criminal, however it happened to be introduced.

A SNOW-STORM ON AN ELECTRIC ROAD. — On Friday, Nov. 9, St. Joseph, Mo., was visited by one of the most severe snow-storms in the history of the city. According to the *Daily Gazette*, "the big storm completely paralyzed business, and shut this section of the country off from communication with the world. The snow which fell was of the damp variety, and at 2 o'clock in the afternoon the loaded telegraph and telephone wires began to break under the pressure. Then the heavy electric-light wires began to fall, and at 4 P.M. every thing was demoralized. Many telephones were burnt out, and the entire system of the city was rendered practically useless." Speaking of the cars on the Sprague Electric Street-Railroad, the *Gazette* continues, "There were present all the conditions which it was feared might impair the usefulness of the new motor, but not the least inconvenience or delay resulted. With the use of two-fifths the capacity of the plant, the usual number of cars were operated, and made the usual time. And not only did the storm illustrate the reliability of the electric motor, it also showed that the Union Passenger Railroad line people made no mistakes and did no poor work in constructing their line. Not a wire was broken down, nor was any other defect in the appliances developed. Telegraph-wires were down in every direction, and the telephone-wires of the city suffered great damage; but the wires on the Union Railway line stood the test without the slightest damage."

PROTECTING IRON AND STEEL BY ELECTROLYSIS. — The methods at present in use for the prevention of oxidation of steel and iron have all the same object, namely, the formation of a coating of magnetic oxide of iron; but all of them are more or less unsatisfactory. Considerable time is usually required, and there is no certainty that the protection will be perfect. M. de Méritens has been experimenting for some time on an electrolytic method of obtaining the same result, and has finally been successful. *Industries* describes the process as follows: "The article is exposed to a current of electricity in a bath consisting of ordinary water, or, better, of distilled water, heated to 70° or 80° C. The object to be coated is made the anode, while a strip of carbon, copper, or iron serves for the cathode; or, if an iron tank is used, the sides of the tank may form the cathode. The current should only have an electro-motive force slightly in excess of that required to decompose water, as too strong a current produces a pulverulent form of the oxide, which does not properly adhere; moreover, it has the inconvenience of eating into polished surfaces. The operation should be conducted in the same manner as electrotyping. In the course of a few minutes, black coloration appears on the article, and after one or two hours the coating of magnetic oxide of iron is of sufficient solidity to resist polishing. The coating is found to penetrate into the mass of the metal; for if the external portion be removed by means of emery, and the white under surface be again exposed in the bath, it becomes black again almost immediately, demonstrating that the effect of the first electrolyzing has affected the mass to some depth. When a piece of rusty iron is treated by the current in a warm-water bath in the manner described, the rust, consisting of ferric oxide, is completely converted into magnetic oxide. The exterior layers are not adhesive, but the interior coating is almost as hard as the metal itself. The best processes employed hitherto for coating steel goods require at least eight or ten days, and only imperfect results are obtained when applied to wrought or cast iron. De Méritens's process treats all sorts of iron and steel effectually in a few hours, requires no preliminary preparation, and can be applied as easily to rough as to polished surfaces. The coating is a brilliant black, is very hard, and it is difficult to attack it with lime; moreover, it is not easily wetted by water.

BOOK-REVIEWS.

On the Senses, Instincts, and Intelligence of Animals, with Special Reference to Insects. (The International Scientific Series, No. LXIV.) By Sir JOHN LUBBOCK. New York, Appleton. 8°.

SIR JOHN LUBBOCK'S varied, valuable, and interesting contributions to science have gained for him a high place among anthropologists and biologists as well as scientists in general. He is an eminent example of the union of ingenuity with painstaking compilation and wide observation that has distinguished so many

Englishmen of science; notably, Darwin, Francis Galton, E. B. Tylor, G. J. Romanes, and others. This reputation is sufficient to secure for any production of his pen wide and careful attention, and to make a notice of its contents a serviceable task. The present volume has more about it of the spirit of the compiler of scientific memoirs than of the ingenious experimenter and the popular writer. A very large share of the work is given over to an anatomical description of the sense-organs of the lower forms of life, and to a discussion of their probable mode of functioning. A bibliographical reference-list of 215 numbers shows how diligently the details have been compiled; and yet the general impression with which one comes away from this portion of the work is, that, in spite of all the work and study, our information is extremely vague and defective. Strange as it may seem, in studying the lower forms of sense-organs it becomes difficult to distinguish between an eye and an ear, an organ of taste, smell, and touch. Our own experience with sense-organs so entirely disposes us to think of the sensations of other animals as essentially similar to our own, that it is difficult for us to realize how different they may be. Not alone are there "animals which have eyes on their backs, ears in their legs, and sing through their sides," but the very sensations thus denoted may really be quite other than in ourselves. Between the highest vibration that we can hear as sound and the lowest that we can see as color, there is an immense gap, which may be only partially present to the senses of other animals.

It would be impossible to indicate here the contents of the richly illustrated descriptions of sense-organs, the enormous variety of their nature and development, their peculiar adaptations to the requirements of the environment. Nature has more than one solution for many of her problems; and the different forms of sense-organs form her answers to the problem of adaptation of physiology to physics. The eye, especially, seems to be a very cheap product; the re-action to light being well established in plants, and the forms of optic organs obtaining an enormously complicated variety in insects. Anatomists have discovered much, but physiologists have done little to give meaning to these discoveries. The method promising best results is the comparison of normal individuals with individuals deprived of a presumable sense-organ. Forel, for example, finds, that, while normal ants will always avoid ultra-violet rays, ants with their eyes varnished are no longer able to distinguish between this and other colors.

Following the chapters upon the anatomy of sense-organs and a chapter upon 'Problematical Organs of Sense,' come chapters upon 'Bees and Colors,' upon 'The Limits of Vision in Animals,' upon 'Recognition among Ants,' upon 'The Instincts of Solitary Wasps and Bees,' upon 'The Supposed Sense of Direction,' and upon 'The Intelligence of the Dog.' Much of the matter here treated has already been published in other shape. It is a *résumé* of points upon which experiments have been made rather than a systematic compilation. The accurate distinction of colors by bees, the connection of this color-sense with the fertilization of flowers, are quite familiar. The limits of vision in animals is a point still deeply in dispute. In answer to the question whether the thousands of ants in one nest, always recognizing one of their own number, but remorselessly attacking all strangers, do so by a smell peculiar to the community, or by a password, the observations seem to say that neither explanation gives complete satisfaction, but further experimentation may clear up its mysteries. The peculiar instincts of wasps and bees, now paralyzing an enemy with all the skill that knowledge of its anatomy could give, again providing for the nutrition of its offspring with a foresight apparently mathematical in its exactness, make us marvel and reflect. Nor is our contemplation made clearer when we observe that this same wise bee has not sense enough to fill up a hole made in her honey-cell, but for an entire afternoon, and more, pours in honey at the top, only to have it flow out of the bottom like the vessel of the Danaides. The wonderful sense of direction ascribed to insects proves, upon careful inquiry, to resolve itself into a moderately successful but by no means infallible or direct appreciation of environment. The final topic, the intelligence of the dog, deserves a further word. In it Sir John describes his attempts at teaching his dog, Van, to express his wishes by language. A large number of cards are printed with such words as 'food,' 'tea,' 'water,' 'bone,' 'out,' and so on, upon them; and by a system of rewards Van has learned to associate his desires with the visual shapes of the letters. When he wants water, he brings not only at command, but spontaneously, the placard bearing that word. This certainly is a noble achievement, and opens up vast possibilities. Quite discouraging, on the other hand, are the attempts to teach the dog to bring a colored card to match the color presented to him. This was diligently taught him again and again, but Van seemed never to get a clear notion of what was desired. 'Can Animals Count?' is the last point treated in the volume, and the question largely resolves itself into determining how large a number of objects can be and the withdrawal of one be noticed. Many animals (birds, etc.) can doubtlessly distinguish between four and five, but no more definite statement can be hazarded. A curious observation is that given by Mr. Huggins concerning his dog, which can apparently perform wonderful mathematical calculations by watching the expressions (all unconscious) of his master, — a valuable hint for telepathy.

All in all, then, the present volume is a convenient and well-compiled reference-book on animal psychology, but is destined to be superseded, as our knowledge advances, by one with fewer gaps and fewer confessions of ignorance. It treats of a fertile field the true importance of which has only recently begun to be realized. A rich success awaits him who has the ingenuity to devise, and the patience to carry out, real successful methods for testing the mental powers of the mute creation; who can decipher these animal hieroglyphics, or force the unwilling sphinx to yield up its enigma.

Works of Thomas Hill Green. Vol. III. *Miscellanies and Memoir.* Ed. by R. L. NETTLESHIP. New York, Longmans, Green, & Co. 8°.

THIS is the concluding volume of Green's works, and consists of essays on a variety of topics, with a sketch of his life by the editor. The memoir is well written, and, for philosophical readers, interesting, though the life of such a man is necessarily lacking in the outward incident characteristic of a more stirring career. The editor, therefore, takes occasion to give an account of Green's views on philosophical and practical subjects, and to indicate to a certain extent the sources in his own character and in the writings of others from which they were derived. Green, as is well known, was an Hegelian; and, though he did not accept all of Hegel's views, the familiar catchwords of the Hegelian philosophy perpetually recur in his writings. The present volume, however, is not all, nor even mainly, devoted to philosophical themes, but contains papers, and some of considerable value, on history, education, and other subjects in which the author was interested. The principal philosophical paper is on 'Popular Philosophy in its Relation to Life,' and is a vehement attack on the English school of thought, especially as represented by Hume. It shows an irritability that is to be regretted, and probably most readers will think the author's own views quite as far from the truth as those that he criticises; but, as illustrating a certain phase of current philosophical thought, the paper is of interest. Several of these 'Miscellanies' are on religious themes, and show the attempts that Green made to adapt the Christian dogmas to his own philosophy, — attempts, as it seems to us, but very slightly successful. For instance: his theory of God is one that makes him no God at all in the view of Christianity or of any other existing religion. He expressly says that God is nothing but the ideal self, the possible perfect man that each of us ought to become; and there is no reconciling this doctrine with the teachings of Christianity.

But, however peculiar may have been his religious views, his interest in moral improvement, both personal and social, was deep and strong. Some of the most interesting passages in the volume before us are those in which he shows his sympathy for the poor, and his desire for their moral and intellectual elevation. He was dissatisfied with existing English society, consisting of the educated few and the uneducated many, and he warmly advocated the extension and improvement of the common-school system as the only practicable means of removing the evils he deprecated. He regarded common education as "the true social leveller," and looked for the time when "the sort of education which alone makes the gentleman in any true sense will be within the reach of all." Besides papers on the various subjects above alluded to, this volume contains a series of lectures on the English Revolution of the seven-

teenth century, in which the causes of that event and of the ultimate failure of the Commonwealth are stated with clearness and true historical insight. Indeed, we think most of his readers will agree that he would have done better to have spent more of his time on history and politics, and less on the inculcation of the Hegelian philosophy.

Ancient Rome. By RODOLFO LANCIANI. Boston and New York, Houghton, Mifflin, & Co. 8°. $6.

THE comprehensive description of the results of modern archæological researches in Rome by Professor Lanciani in the beautifully printed and illustrated volume under review is a publication of great interest and value. The author, who is director of excavations for the Italian Government and the municipality of Rome, describes the results of his labors with such vividness and enthusiasm, that he at once imparts to the reader the keenest interest in his subject. In the preface the history of the work that is going on now is sketched. The improvements undertaken in modern Rome, which of course cannot but necessitate the destruction of a few monuments, have been the subject of numerous attacks upon the Roman authorities, which the author refutes one by one, showing that the growth of the large city, and the requirements of the present inhabitants, made sanitary improvements imperative, and that these very improvements have been made in judicious consideration of the interests of archæology, and that they have yielded archæological results of greater importance than were obtained in any previous period. In the first chapter the history of the destruction of ancient and mediæval monuments is traced, illustrated by views of parts of Rome reproduced from old descriptions.

In the second chapter we are led back to the time of the foundation of Rome, which the author proves to have taken place in the bronze period, by shepherds from the Albanese hills. The remains of stone implements, bronze weapons and coins, and rough earthenware, are described. The development of sanitary measures, the building of the aqueduct and drains, is next described, and the author's views are substantiated by the descriptions of the ruined works and by translations of interesting inscriptions.

We cannot follow the author in the details of his great work, which gives a vivid picture of life in ancient Rome in the light of the most recent archæological discoveries. He has selected only the most significant and valuable material from among the rich treasures intrusted to his care, for proving his views and theories. The publishers have spared no expense in order to make the volume as valuable and attractive as possible. The work cannot be excelled as a comprehensive and popular review of the results of archæological studies in Rome.

B. C. 1887. *A Ramble in British Columbia.* By J. A. LEES and W. J. CLUTTERBUCK. London and New York, Longmans, Green, & Co. 12°. $2.25.

IN the present volume the authors describe a hunting-trip from the Canadian to the Northern Pacific, up the Columbia and down the Kootenay Rivers. The book is beautifully printed, and illustrated by excellent photo-engravings reproduced from sketches and photographs of the authors. Those who are interested in angling, hunting, and other sport, and in *menus* of the dinners the travellers enjoyed on various parts of their journey, will find the book very interesting reading; but the illustrations make it valuable also to other readers. The authors succeeded in encountering the most marvellous adventures, particularly when they reached American soil, all of which are illustrative of the low state of culture in which our western Territories, as compared to British Columbia, are. If we take the authors' description *cum grano salis*, it is a good description of what travelling in the Kootenay valley under unfavorable circumstances might be. The good luck of the authors in having many marvellous adventures makes the book very interesting reading, and welcome to lovers of books of travel.

Die Gletscher der Ostalpen. By Dr. E. RICHTER. Stuttgart, J. Engelhorn. 8°. $3.

THE present volume belongs to the series of manuals of German geography published at the instance and under the direction of the commission for studies on the geography of Germany, which also edits the interesting 'Forschungen zur Deutschen Landes- und Volkskunde.' Dr. Richter has compiled a large amount of material on the glaciers of the eastern Alps, his material being principally derived from the map of the Austrian War Department. In an introduction the author discusses the methods of determining the limit of eternal snow, and adopts the principle first applied by Brückner, who collates data on summits which nearly reach the limit of eternal snow, but have no accumulations of snow and ice on exposed slopes, and such data on mountains which have small snow-fields and glaciers. He concludes that the snow-line is intermediate between the heights of the summits of these mountains. Dr. Richter discusses this method very fully, and later on applies it to the eastern Alps. We cannot enter into his interesting descriptions of glaciers and of their advance and retrogression, but call attention to an important result of his investigations, that the central parts of the Alps have a higher level snow-line than the northern and southern portions. Chains of mountains have the same effect upon the height of the snow-line as plateaus have, the line being lower on the outskirts and higher in the central portions.

NOTES AND NEWS.

IN a memorandum prepared by the executive committee of the Dominion Land Surveyors' Association a number of rules are suggested as a remedy in the confusion of the geographical nomenclature and orthography in Canada. The principal feature of these resolutions is the suggestion of the compilation of a complete geographical dictionary of the Dominion by the Department of the Interior, and that all names given by explorers in new tracts of country be submitted to the surveyor-general, and, after approval by him, be entered in the geographical dictionary before being shown on any official maps or plans. Besides this, the rules of the Royal Geographical Society for spelling Indian names are recommended.

— The *Flamme*, the official organ of the Berlin Cremation Society, states that the total number of bodies cremated in the various countries to the 1st of August is as follows: Italy, 998; Gotha, 554; America, 287; Sweden, 39; England, 16; France, 7; Denmark, 1. The members of cremation societies number 3,012 in Sweden, 1,326 in Denmark, 1,326 in Holland, 612 in Germany, 580 in Italy, 438 in Hamburg, and 390 in Switzerland (Zurich). There is a curious disparity between the number of members in Italy and the proportion cremated. It is officially stated that outside of Asia there are but fifty cremation-furnaces in existence. Of these, twenty are in Italy, one in Germany, one in England, one in Switzerland, one in France, and the rest in the United States. From this statement it would appear that cremation has not made the rapid strides which its advocates hoped for.

— Mr. A. Howard Clark, of the Smithsonian Institution, has been appointed by the President to be one of the scientific experts to attend the international exposition in Paris in 1889. Mr. Howard was a member of the executive staff of the United States commissioner to the international fisheries exhibition in London, in 1883.

— Prof. C. V. Riley, of the Agricultural Department, the representative in charge of the exhibit of agricultural products from this country to the Paris exposition, has issued a circular in which he announces that a board has been formed in the Department of Agriculture, consisting of Professor Riley, William Saunders, O. D. LaDow, M. Trimble, and Dr. D. E. Salmon, to decide upon the agricultural exhibit.

— No. 95 of Van Nostrand's Science Series is entitled 'Plate-Girder Construction,' by Isami Hiroi. For railway as well as highway bridges, there is probably no other form of girders that are more extensively used and daily being constructed than plate-girders. The reason for this lies mainly in the simplicity of their construction, and their stiffness as compared with open-girders. That the construction of a plate-girder is simple, is, however, no reason to suppose that the stresses produced in it by external forces are also simple. On the contrary, to determine actual stresses in every part of a plate-girder is one of the most complicated problems that can

come in the way of bridge engineers. It is the aim of the writer to present, in as simple a manner as possible, a somewhat rational mode of designing girders of this class with special reference to American practice; and, in the absence of any particular treatise on the subject within the reach of every one as yet, it is hoped that it may be of some help to beginners in bridge-designing. —— Some questions addressed to the editor of *The Engineering and Building Record and The Sanitary Engineer* by persons in the employ of new water-works indicated that a short series of practical articles on the details of constructing a water-works plant would be of value; and at the suggestion of the editor, Mr. William R. Billings prepared a series of papers for the columns of that journal, entitled 'Some Details of Water-Works Construction;' and now, in a more convenient form than is afforded by the columns of the paper, these notes of actual experience are offered to the water-works fraternity with the belief that they may be of assistance to beginners, and of some interest to all. —— The Popular Publishing Company at Chicago Lawn publishes a 'Key to the Families of Insects,' by N. M. Eberhart, which gives in a few pages the characteristic features of each order and family of insects. —— Prof. John Henry Comstock has published the first part of an 'Introduction in Entomology.' The work has been prepared to meet the demand for a text-book which shall enable students to acquire a thorough knowledge of the elementary principles of entomology. Although much pains has been taken to render easy the classification of specimens, an effort has been made to give the mere determination of the names of insects a very subordinate place, much space having been given to the habits and transformations of the forms described. The book is illustrated with many figures, many of which are originals. It will prove of good use to students of entomology. ——The Clarendon Press has published the first volume of Robert Etheridge's great catalogue, 'Fossils of the British Islands,' comprising the paleozoic species. The preparation of the manuscript of this catalogue was begun in 1865, and since that time the author has continued this work. The present volume comprises 1,588 genera and 6,022 species arranged stratigraphically, and also classified zoölogically. A supplementary index brings the work down to 1886. It not only contains all additional species described since the catalogue was in type, but also records the changes in the nomenclature and distribution of many zoölogical groups and species previously catalogued, which had been rendered necessary by the progress of research. —— Mr. William Archer, the English dramatic critic, has just completed 'Masks or Faces?' a study in the psychology of acting, which Longmans, Green, & Co. will issue at once. Mr. Archer takes up afresh the question debated by M. Coquelin and Mr. Irving as to the amount of feeling an actor should have. He has collected from books and from leading living actors a mass of pertinent and interesting anecdotes. Among those who have helped him are Mary Anderson, Mrs. Kendal, Genevieve Ward, John Drew, and Dion Boucicault. The same firm will bring out 'Son of a Star,' by Dr. B. W. Richardson. This is an historical romance of Great Britain and Judea in the days of Hadrian. —— Ginn & Co. will publish in January, 1889, 'The Leading Facts of French History,' by D. H. Montgomery. The general plan of treatment is practically the same as that pursued in the author's 'Leading Facts of English History.' —— Scribner & Welford announce 'The Reminiscences and Recollections of Captain Gronow: being Anecdotes of the Camp, Court, Clubs, and Society, 1810–1860,' with portrait, 4 woodcuts, and 20 etched and aquatint illustrations from contemporary sources, by Joseph Grego. It had been the lot of Captain Gronow "to have lived through the greater part of one of the most eventful centuries of England's history; to be thrown amongst most of the remarkable men of his day, whether soldiers, statesmen, men of letters, theatrical people, or those whose birth and fortune — rather, perhaps, than their virtues and talents — have caused them to be conspicuous at home and abroad." The twenty plates etched by Joseph Grego throughout, are finished in aquatint, — an art which flourished at the period in question, and was much in favor for book-illustration. Mr. Grego has been fortunate in securing the assistance of an artist who for more than half a century has devoted himself to the development of this branch of art. The edition consists of 870 copies for England and America, with the 25 illustrations in duplicate, — one on plate paper, remarque proofs; and the other on Whatman paper, with titles, and colored by hand. The type has been distributed. Each copy is numbered as issued. —— 'Worthington's Annual' is the handsomest juvenile book made this year. It is a surprise for the price ($1.50) in the quality and quantity of matter and engravings. It has an illuminated cover, brilliant full-page colored plates made expressly for the book. It is something more than a mass of pretty pictures. It has interesting stories, biographies, papers on natural history, and these are illustrated by more than 300 engravings. No expense or pains have been spared to make it worthy of the wide constituency which it is bound to have. It is in every way creditable to author and publisher, and will be hailed with delight by armies of children. If any better or larger children's annual, or one more entertaining and instructive, was ever made for the price, we have yet to see it. It is a striking proof that publishers sometimes look to the interest of their readers as well as to their own profits. We commend it heartily.

— 'Dunraven Ranch' is the name of the new novel which Captain King contributes to the December number of *Lippincott's Magazine*. A full-page portrait of the author decorates the number. A biographical sketch by Lieut. Philip Reade, who has been King's lifelong friend, gives many episodes in the life of the soldier-author. The serial 'At Last: Six Days in the Life of an Ex-Teacher,' by John Habberton, is of interest. 'With the Fruits and the Wines,' by G. S. R., is a sketch full of information. Thomas Leaming has a valuable article on 'Trust and Title Insurance Companies,' in which the growth and development, the uses and possible abuses, of these novel institutions, are treated. The One Hundred Prize Questions are as interesting as ever. Of the poetry, the most notable is Edgar Saltus's 'Imeros' and a series of sonnets by Amélie Rives, 'To all Women.' —— In *St. Nicholas* for December is Mrs. Mabel Loomis Todd's account of a stay of 'Ten Weeks in Japan,' in which the story of the total eclipse of August, 1887, is told from the experience of an actual participant in the observations. The instruments and the temporary encampment of the expedition, as well as many beautiful and strange sights of this interesting country, are presented to the reader by illustrations taken from photographs. —— In the *Atlantic Monthly* for December are to be 'The Future of the Country College,' by William De Witt Hyde; 'Passe Rose,' X.–XII., by Arthur Sherburne Hardy; 'Urbs Animæ,' by H. W. P. and L. D.; 'A Devil's Passage,' by Louise Stockton; 'The Close of Garibaldi's Career,' by William R. Thayer; 'A Flight in the Dark,' by S. K. and V. D. S.; 'Boston Painters and Paintings,' by V. William Howe Downes; 'William Warren,' by Henry A. Clapp; 'A Convent School of the Last Century,' by Susan Coolidge; 'The Despot of Broomsedge Cove,' XXV.–XXVI., by Charles Egbert Craddock; 'At Alfred de Musset's Grave;' 'Letters from Dorothy Osborne to Sir William Temple;' etc. We observe, by the way, that the publishers are to furnish in the January number a new steel engraving of John G. Whittier, who wrote one of the articles which appeared in the initial *Atlantic* for November, 1857, and who has been a frequent contributor from that time to the present. —— *The Classical Review*, established less than two years ago, has already amply justified the hopes of its founders. Under the editorship of the Rev. Joseph B. Mayor, assisted by Prof. A. J. Church, Mr. A. M. Cook, and Mr. Cecil Smith, it has secured the active support of the leading classical scholars of Great Britain. The familiar names of Archer-Hind, Butcher, Ellis, Hicks, Henry Jackson, Jebb, Lang, Leaf, J. E. B. Mayor, Merry, Monro, Nettleship, Newman, Palmer, Reid, Roberts, Sandys, Sidgwick, and many others, are found in the list of contributors. The English editors of the *Review* desire to make it an international philological organ, and have invited Prof. Thomas D. Seymour of Yale College, Prof. John H. Wright of Harvard University, and Prof. W. G. Hale of Cornell University, to act as associate editors for the United States. They propose to increase the size of the *Review* by one-half, giving three sheets (forty-eight pages) to each number, and thus allowing ample space for contributions from American scholars. The invitation has been accepted, and the proposed arrangement will go into effect with the first number of Vol. III. (January, 1889). Ginn & Co. are the publishers for America.